

**NOT  
MEASUREMENT  
SENSITIVE**

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August 1995**

# **DOE HANDBOOK**

## **IMPLEMENTING U.S. DEPARTMENT OF ENERGY LESSONS LEARNED PROGRAMS**

### **Volume I**



**U.S. Department of Energy  
Washington, D.C. 20585**

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## Foreword

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### Purpose

The purpose of this Department of Energy (DOE) Lessons Learned Handbook is to provide DOE and DOE contractor organizations with information that can be used to modify existing lessons learned programs or to develop new programs. The Handbook is divided into two volumes. Volume I (this volume) clarifies and supplements the guidance included in the DOE Lessons Learned Technical Standard: Development of Lessons Learned Programs, published in May 1995. Volume II, the Handbook appendices, provide examples of documents from existing lessons learned programs (e.g., procedures, program descriptions, transmittal documents, examples of communications material, corrective actions tracking forms, and program reviews). Volume II also includes industry sources of lessons learned, functional categories, and frequently asked questions regarding the Lessons Learned List Service.

### Background

This DOE Lessons Learned Handbook was developed with information from many sources including methods and guidance implemented by site-specific lessons learned programs, DOE Lessons Learned Process Improvement Team research and surveys, and information gathered from DOE Offices.

### Approach

There are many ways to develop a lessons learned program. This volume of the DOE Lessons Learned Handbook is structured around four phases of program development:

- Getting Started
- Familiarization and Training
- Program Implementation
- Maintenance, Measurement and Continuous Improvement

The specific activities, milestones, and products that are included in each phase should be determined internally. However, this Handbook will explain the general characteristics of each of these phases and, in some cases, provide suggested sequence and timing.

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# **Phase I**

# **Getting Started**

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## Section 1.1

# Planning a Lessons Learned Program

## Ten Basics Steps

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This section provides ten steps that can be helpful in getting started with development of a lessons learned program. The order in which they are presented provides a logical sequence. However, it is not critical that the steps always be conducted in this order or that they be conducted consecutively (most steps can be conducted in parallel).

### **1. Incorporate Lessons Learned into Corporate Policies and Strategies**

Ensure that the lessons learned program is endorsed by senior management and written into corporate policies. This may require nothing more than a one sentence endorsement in organizational policy documentation simply to communicate commitment to the program.

### **2. Write a Program Description**

A Program Description provides a clear understanding of what the Lessons Learned program is designed to accomplish and how the program's objectives will be achieved. The Program Description should include a statement of the program's purpose and objectives and describe how the objectives will be achieved. This explanation may include a discussion of the intended approach for achieving the objectives of the program and a description of the specific activities that will be conducted. (See Volume II, Appendix I for an example of a Program Description.) It may also discuss how the lessons learned program objectives will support corporate policies and strategies. The Program Description does not provide specific details. Rather, it provides an overview of how the program will function. It may also be helpful to develop a graphical display of the program. One option is to develop a flow chart that identifies program inputs, activities and outputs (See Volume II, Appendix II for an example).

### **3. Write a Management Plan**

The Management Plan provides a strategy for implementing the lessons learned program. It may need to be updated yearly based on self-assessment activities and other program input. The Management Plan describes the tasks that will be completed, the responsible party, and the timing of these tasks. The Management Plan may include a table of principal project milestones that includes the milestone title, date and participants; relationship of the program to other projects or initiatives; and an explanation of how the project team responsible for program development will interact with other DOE or external organizations. The Management Plan may also

include discussion of resource needs (e.g., required personnel, office space, equipment/computer hardware and software). It is helpful to supplement the text in the Management Plan with graphical presentations such as logic diagrams or key activities diagrams (Gantt charts). Gantt charts graphically present the start and end dates of planned tasks as well as task dependencies (tasks that must be completed before dependent tasks can begin). A description of logic diagram development and a sample logic diagram are provided in Figure 1. An example of a gantt chart is presented in Figure 2.

#### **4. Identify Lessons Learned Coordinators/Managers**

It is suggested that Lessons Learned Coordinators and Managers be identified early in the planning process. These individuals should contribute to the development of the program and related documentation. Newly established Lessons Learned Coordinators should also contact Lessons Learned Coordinators at other DOE sites and access available documentation from existing lessons learned programs (some examples are provided in Volume II of this Handbook). One of the early responsibilities of the Lessons Learned Coordinators and Managers should be to define the responsibilities and actions that will be required to implement the lessons learned program. It is suggested that these responsibilities be assigned to appropriate personnel. (See Volume II, Appendix III for an example of a Management Requirements and Procedures document that defines responsibilities.)

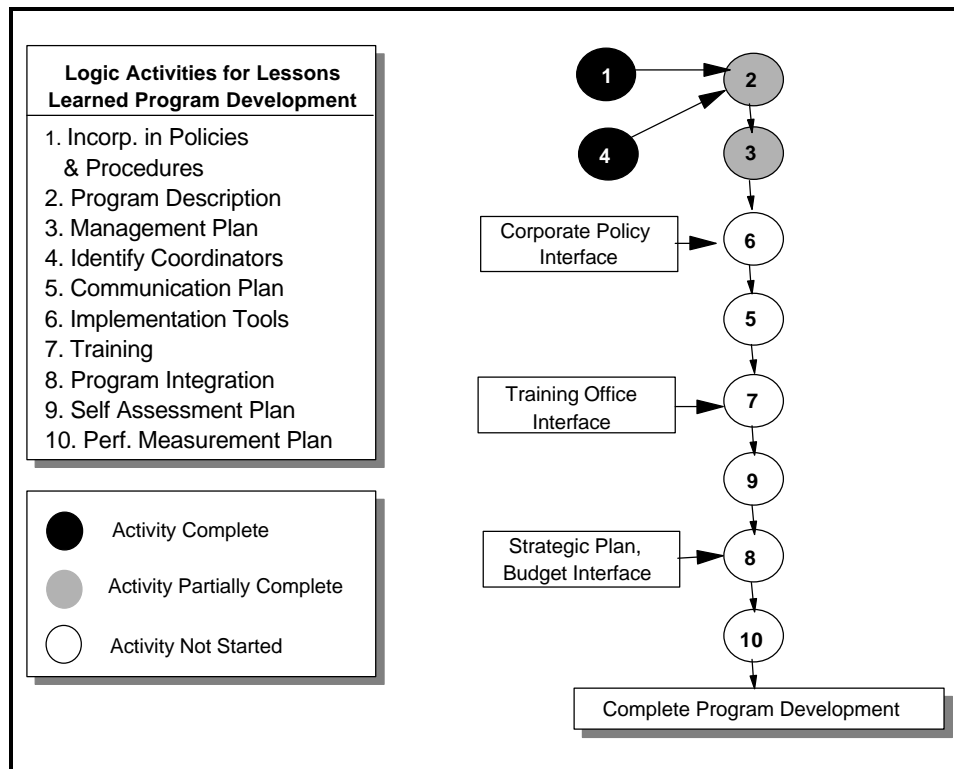
#### **5. Develop a Promotional/Communications Plan**

Lessons Learned promotional material and communication plans are developed to reach a broad audience with program information. These plans should be used to encourage participation and to ensure that all employees are aware of their own roles and responsibilities as well as those of others. These plans should be used to reinforce program benefits and to highlight opportunities for employees to contribute and receive information. Promotion/communication objectives should be tied to employee orientation and training. The communications plan should include several different vehicles for spreading information about the program. These may include articles and publications (e.g., a schedule for submitting articles to a site-level publication, a permanent feature section in an established publication, or a publication dedicated exclusively to lessons learned); distribution of pamphlets or flyers (See Volume II, Appendix IV for examples of communications material); workshops and training programs; presentations at staff meetings; use of bulletin boards for presenting promotional material; and a series of computer messages introducing special aspects of the program. It is important to maintain a steady and continuous flow of information about the program. It is also important to develop customer feedback mechanisms such as questionnaires, telephone surveys, and focus group meetings.

**Figure 1**  
**Developing Logic Diagrams**

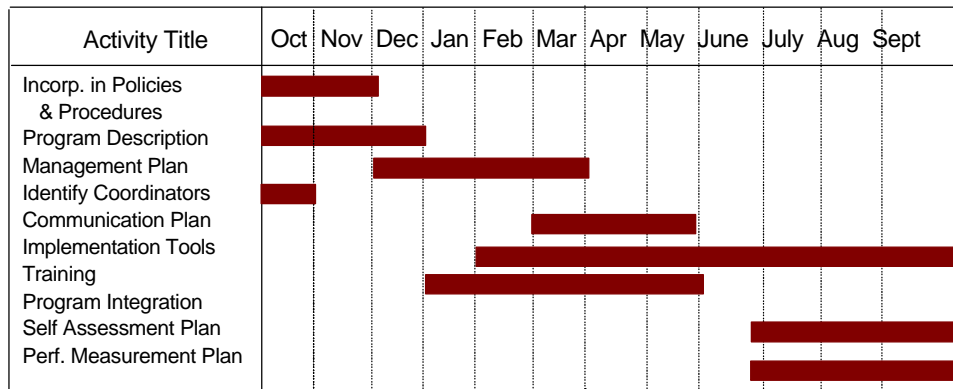
Logic diagrams can effectively be used to present lessons learned program development activities or to describe lessons learned processes or procedures. Logic diagrams generally do not have dates attached. Rather, they provide a graphical depiction of the activities that will be achieved, the relationships between these activities and the order in which they will be accomplished. In some cases, it may be helpful to generate detailed logic diagrams focusing on specific activities or subcomponents of major activities. Logic diagrams should be constructed to portray the steps necessary to take an activity from conception to the desired end condition. The diagrams can represent activity paths in series, in parallel, or in combinations (series and parallel). The information included in the logic diagram may also contain key interface requirements. These requirements may include both programmatic and operational interfaces necessary to complete the events and activities shown in the logic diagram.

**Sample Logic Diagram for Lessons Learned Program Development**



**Figure 2**  
**Key Activities Diagram**  
**(Gantt Chart)**

Gantt charts complement logic diagrams by placing key activities on a timeline. Gantt charts describe the sequence of planned activities. They can also be used to depict activity dependencies. The following gantt chart depicts the start and end dates of the key activities recommended to begin development of a lessons learned program. Once these dates have been established, the gantt chart provides a means of communicating and managing the project schedule.



## 6. Develop Program Infrastructure and Implementation Tools

Before the lessons learned program can be implemented, it will be necessary to ensure that the necessary infrastructure is in place. A basic infrastructure check list may include the following:

- Program Description
- Management Plan
- Appropriate Personnel
- Defined Roles and Responsibilities
- Procedures
- Template for Documenting Lessons Learned
- Equipment/Computer Hardware and Software
- Internet Connection
- Orientation/Training
- Financial Resources (if necessary)

### Corrective Action Identification and Implementation

The lessons learned infrastructure should balance communications with actions taken to prevent undesirable events and encourage positive actions. The infrastructure should also balance electronic with non-electronic methods for sharing information. Non-electronic methods may include developing a process to disseminate hard copies of lessons learned, establishing a lessons learned newsletter, or other options. (See "Non-electronic Dissemination" section of this Handbook and Volume II, Appendix VIII for examples of documents that transmit lessons learned information non-electronically.)

Lessons Learned procedures should be developed for identifying, documenting, reviewing, disseminating, and implementing lessons learned; ensuring that all lessons pass an appropriate level of security and control clearance; and for accessing and using lessons learned. Elements such as timeliness, style, and level of detail should be included in these procedures. The DOE Lessons Learned Standard provides guidelines in these areas. The DOE Lessons Learned Standard was published in May 1995 and is available from the Office of Scientific and Technical Information, Oak Ridge, Tennessee. (See also, Volume II, Appendix III for examples of lessons learned procedures.)

Further implementation tools include forms and standard reporting and screening formats. For example, it is suggested that each site develop a template for documenting lessons learned. The consistency achieved through use of a template

will make it easier to store, search, access, and use lessons learned once they have been documented. The DOE Lessons Learned Technical Standard requires that all lessons placed on the complex-wide Lessons Learned Information Services be prepared according to the DOE lessons learned template (provided in Appendix B of the Technical Standard, available through the Office of Science and Technical Information, Oak Ridge, Tennessee). To save the work of converting site lessons learned to the DOE format for complex-wide dissemination, sites should consider using the DOE-wide template for internal use.

## **7. Develop Employee Lessons Learned Orientation/Training**

Organizations should develop a brief employee orientation program that provides an overview of the lessons learned concept and explains how it will be implemented at the site. In addition, management may determine that it is necessary to develop a more detailed training program to ensure that employees understand how to document lessons learned, gain approvals and clearances, disseminate the information, address timeliness issues, search and access lessons learned, and incorporate lessons learned into plans and future activities. The "Lessons Learned Training" section of this Handbook provides information to assist the development of lessons learned training programs.

## **8. Integrate Lessons Learned into Existing Management Processes**

It is important that personnel at all levels understand how and why the lessons learned program will be integrated into the "big picture" of activities and management processes that exist throughout the organization. This information can be provided graphically in a chart that identifies key program interfaces. Program integration should also be discussed in policy and management documents such as the Program Description and the Management Plan.

## **9. Develop Review and Self-assessment Plans**

Review and self-assessment plans should be developed to assess the effectiveness of the lessons learned program. Reviews and self-assessments should be conducted to identify the strengths and weaknesses of the program and to pinpoint areas that need adjustment. Assessments should highlight both problem areas and positive results. Additional information on reviews and self-assessments is provided in the "Continuous Improvement" section of this Handbook and in Volume II, Appendix X.

## **10. Develop Performance Measures**

Performance measurement should focus on improvements or worsening conditions in the organization that are directly impacted by the lessons learned program. In many cases, organizational improvements or problems will be tied to many variables, making it difficult to isolate the effects of the lessons learned program. However, measures can be developed that are tied to the goals and objectives of the lessons learned program and reflect the information that is shared through the lessons learned

process. Information on how to develop performance measures is provided in the "Performance Measurement" section of this Handbook.

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## **Phase II**

# **Familiarization and Training**

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## **Section 2.1**

### **Familiarization**

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One of the best ways to become familiar with the concept of lessons learned and to determine the optimal way of developing a program is to talk to people who are already involved in the process. There are Lessons Learned Coordinators across DOE who have experience with developing lessons learned programs and who have learned many lessons by implementing a program at their site. Although many of the existing lessons learned programs are focused solely on reporting to the Occurrence Reporting and Processing System, there are also programs that are much broader in scope. The "Dissemination of Lessons Learned" section of this Handbook provides information on lessons learned information services that are available through DOE's Technical Information Services. These services provide options for communicating with individuals throughout DOE about lessons learned and other topics. For example, messages placed on the DOE Lessons Learned List Server are automatically sent to all Lessons Learned Coordinators. These services provide great potential for connecting people across the complex and for sharing information.

It is also possible to contact Lessons Learned Coordinators directly. A list of DOE Lessons Learned Coordinators will be available on the DOE Lessons Learned List Server. This list will include contact information and will periodically be updated. To subscribe to the DOE Lessons Learned List Server, see Volume II, Appendix XIII: Frequently Asked Questions About the Lessons Learned List Server.

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## **Section 2.2**

### **Lessons Learned Training**

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Lessons learned training can be a simple orientation session or a formal training program. All staff that will be involved in the lessons learned program should receive basic training to acquaint them with the lessons learned process and the accompanying requirements. Two types of training will be addressed in this section -- (a) general employee orientation and (b) training for Lessons Learned Coordinators, managers overseeing the lessons learned program, and staff responsible for implementing the lessons learned program. In addition, this section will briefly discuss training roles and responsibilities, evaluation processes, and applicable documents.

#### **General Employee Orientation**

A general employee orientation session should be held for all employees to introduce the concept of lessons learned, and to build awareness of, and support for, the lessons learned program. The orientation should also provide an overview of the lessons learned process, explain the applicable requirements, and define basic roles and responsibilities. The employee orientation should cover, in broad terms, how to identify, document, access, and use lessons learned. A more detailed explanation of these areas should be provided for employees directly involved in overseeing or implementing the lessons learned program.

#### **Training for Lessons Learned Coordinators, Managers and Staff**

Training for Lessons Learned Coordinators, managers, and staff should explain the lessons learned process, the roles and responsibilities related to the process, and the program's requirements. This training should be required for all technical, supervisory and management employees and should cover all categories of lessons learned including Red/Urgent, Yellow/Caution, Blue/Information, and Green/Good Work Practice. This training should go into greater detail than the orientation session and should cover the following topics: how to develop and disseminate a lesson learned, how to incorporate lessons learned into projects and activities, and how to address lessons learned that require immediate attention.

#### ***How to Develop and Disseminate a Lesson Learned***

Developing a lesson learned generally includes the following processes: identifying, documenting, validating, and completing security clearances. Disseminating a lesson learned requires an understanding of electronic systems and other methods. Dissemination may include more than one approach, depending on the type of lesson learned and the dissemination options chosen by the site. The following training topics should be covered regarding how to develop and disseminate a lesson learned.

- How to identify a potential lesson learned. Include a discussion of the diverse range of experiences, both positive and negative, that may constitute a lesson learned.
- How to determine what is not a lessons learned.
- How to prepare a lessons learned document (content, format, and level of detail).
- Assignment of functional categories to lessons learned (See Volume II, Appendix VI). The discussion of functional categories should include both an explanation of the categories and how they are to be used to classify lessons learned. If these categories are different from those defined in your existing site-specific lessons learned program, explain when each classification scheme should be used (i.e., internal communication may utilize the site-specific scheme while all lessons learned submitted to the DOE-wide system must be in accordance with the requirements stated in the Lessons Learned Technical Standard).
- Validation process and validation criteria. Validation training is particularly important for Subject Matter Experts (SMEs). However, all staff involved in developing lessons learned should understand the validation criteria and where validations fit into the lessons learned process.
- Security issues, the requirements and process for completing a security classification and control review and an Unclassified Controlled Nuclear Information review, and the specific process that should be followed for internal dissemination of classified information (e.g., hard copy dissemination rather than electronic dissemination).
- How to disseminate a lessons learned, including use of dissemination and retrieval systems such as e-mail, Bulletin Boards, and Internet. In some cases, computer-based training may be available to assist the training process (e.g., on-line training is available for users of the DOE Technical Information Services through the Office of Environment, Safety and Health).
- Lessons learned communication process including all individuals that must be contacted at each stage in the lessons learned process, the required timing of the communication, and the media in which the communication must take place (e.g., written notices, verbal, or electronic communication methods).
- Use of on-line help and where to get answers to questions.

#### ***How to Utilize / Incorporate Lessons Learned Information***

Utilizing / incorporating lessons learned focuses on identifying applicable lessons learned and determining how the information can best be used to benefit the site or program. Key training topics should include:

- How to identify and screen applicable lessons learned.
- What to do once an applicable lesson learned has been identified (i.e., identification of corrective actions and development of action plans).

- How to follow-up on actions to ensure that the lesson learned has been incorporated in plans or future activities.

### ***How to Address Lessons Learned that Require Immediate Attention***

A clear process should be established for taking action when a lesson learned requiring immediate attention is identified. Generally, the lessons learned requiring immediate attention will be those that are classified as Red/Urgent (See Priority Guidelines in the DOE Lessons Learned Technical Standard, Appendix C). The following elements should be included in training related to Red/Urgent lessons learned:

- Lessons learned classification scheme with an emphasis on the defining characteristics of a Red/Urgent lesson learned.
- All points of contact that must be notified to facilitate thorough and efficient communication.
- Clear differentiation between lessons learned reporting and ORPS reporting to ensure that both systems receive appropriate information.
- Specific steps that must be taken when Red/Urgent lessons learned are identified including the sequence of required steps, roles and responsibilities, approvals, timing, and follow-up activities.

## **Training Resources**

In order to save time and money in developing training activities, it is suggested that existing resources be identified and, when possible, used. The Training Resources and Data Exchange (TRADE) network is an example of an available training resource that offers training assistance.

TRADE encourages and facilitates the exchange of ideas, techniques, and resources for improving training and development, and serves as a forum for the discussion of issues of interest to the DOE community. The TRADE Training Resources Catalog (TRC) provides an electronic on-line catalog of DOE contractor and federal training courses. TRC is part of the TRADE Online Information System (TRADEON). Any DOE M&O contractor, Operations Office, or Headquarters personnel with a computer, modem, and communication software can access the TRC. The TRADE network is managed by the Oak Ridge Institute for Science and Education (ORISE).

For information regarding TRC or TRADEON, please contact:

Oak Ridge Institute for Science and Education  
TMSD/TIS/Lab Road  
P.O. Box 117  
Oak Ridge, TN 37831-0117

Phone: (615) 576-0492  
Fax: (615) 576-4583

In addition to these resources, there are numerous DOE Guides, Orders, Handbooks, and other documents that provide guidance on training. A list of applicable training documents is provided in Volume II, Appendix XII.

## Training Roles and Responsibilities

Responsibilities for implementation and continued application of DOE lessons learned training should be distributed across various individuals and organizations. The following descriptions provide examples of potential training assignments:

- **Line Management:** Ensure overall implementation of lessons learned training, including the training required by workers to ensure safe performance of their assigned functions, and training required by those involved in the lessons learned process to ensure successful implementation and maintenance of the lessons learned program.
- **Training Organizations:** Review disseminated lessons learned information for applicability and incorporate applicable lessons learned into new and existing training programs.
- **DOE Lessons Learned Points of Contact:** Monitor facility lessons learned training activities, providing assistance as required to ensure consistency with the overall DOE-wide Lessons Learned Program.
- **Site or Facility Lessons Learned Coordinators:** At the organization level, ensure that relevant training programs are identified and staff responsible for implementing the programs are notified. Provide overall coordination of the site or facility lessons learned program. This should include recruiting and training (mentoring) of individual lessons learned points of contact throughout the various organizations at the site or facility, training and mentoring individual people who may be involved in generating lessons learned, providing lessons learned "awareness" briefings for all site personnel on a periodic basis (including making management aware of the necessity, benefits, and workings of the program), and being a strong advocate of active and successful site participation in the DOE-wide Lessons Learned Program (the vehicle through which the dispersed site and facility lessons learned programs will communicate). As necessary, site and facility Lessons Learned Coordinators should also make training from non-DOE sources available.

The DOE Office of Human Resources and Administration (HR-33) is specifically chartered to promulgate Department-wide Professional Development Program policies, plans, and procedures and to support all Headquarters and field organizations by providing for the timely development and delivery of training courses with Department-wide applicability. This role includes development and implementation of a departmental training. HR-33 may be contacted for assistance in developing lessons learned training.

## Evaluation Process

It is suggested that a formal evaluation process be developed to provide information and feedback to participants, instructors, designers, and managers. The primary goal of the evaluation process is to assess training program effectiveness. Evaluations can be conducted through post-training quizzes and examinations. In addition, performance measures can be developed to determine program effectiveness. In general, program evaluation should be conducted to achieve the following goals:

Evaluation Goal	Evaluation Method
○ Verify that the training content, objectives and process are appropriate to meet the training needs.	○ Solicit learners' reactions to course material and presentation.
○ Assess whether training participants acquired the skills and knowledge expected.	○ Conduct written tests.
○ Evaluate whether training participants applied the acquired skills and knowledge to their job.	○ Interview supervisors and employees, observe employees, utilize questionnaires.
○ Assess the impact of improvements in job performance on organizational goals related to lessons learned.	○ Develop specific performance measures that relate the training to specific organizational performance improvement goals and objectives.

In addition, specific performance measures that can be applied to lessons learned training may include:

- Percentage of staff that has successfully completed lessons learned training.
- Number of errors in submitted lessons learned.

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## **Phase III**

# **Program Implementation**

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## Section 3.1

### Developing a Lesson Learned

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"Developing" a lessons learned refers to the process of identifying, documenting, and validating a lesson learned. The goals of lessons learned development are to conduct initial filtering to make sure that the information is relevant and worthy of documentation, to put the information in a format that is concise and can be shared with others, to ensure that the information included is technically correct, and to ensure that the information does not have any security or other restrictions that prohibit its release. Each site should develop a process that is clear and as streamlined as possible. For example, see Figure 3, below.

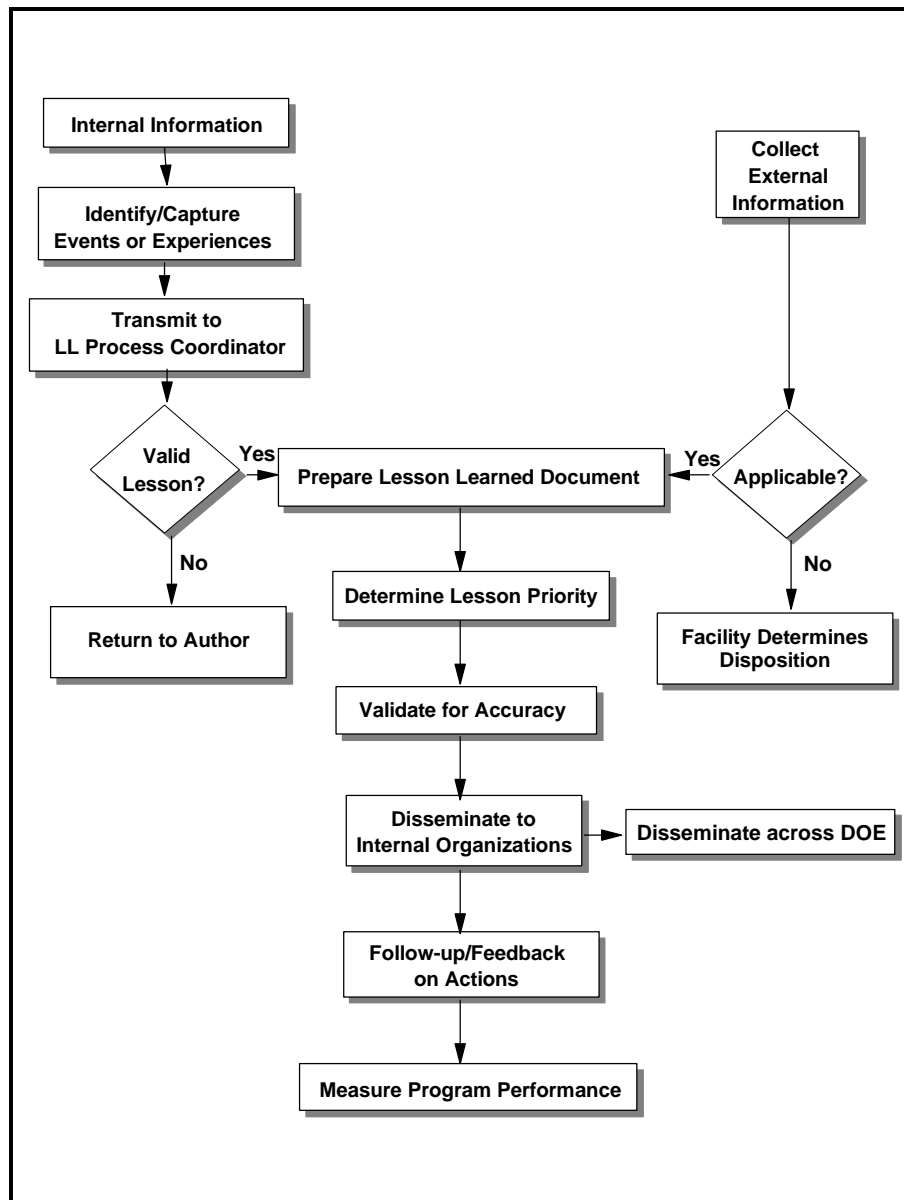
#### Identifying a Lessons Learned Experience

Anyone who knows about an experience, activity, event or good work practice that is of value to others can originate a lesson learned. There are many potential sources of lessons learned. Typical sources include:

- Daily activities and experiences
- Occurrence and incident reports
- Assessment activities
- Operational Readiness Reviews
- Management reviews
- Performance or process improvement initiatives
- Government and industry experiences
- Technical periodicals and bulletins
- Project completion evaluations

(See also list of sources in DOE Lessons Learned Standard)

**Figure 3**  
**Lessons Learned Process Flowchart**



Potential sources should be identified and periodically screened to highlight experiences and conditions for which lessons learned documentation should be prepared. It may be useful to perform lessons learned inquiries at specific steps or stages in processes or operations. For example, the following stages may provide applicable lessons learned:

- Completion of audits, surveillance, reviews, and evaluations by internal, external or independent organizations.
- Completion of relevant project milestones.
- Development or implementation of an idea or method to correct, modify, or otherwise improve current operating or programmatic processes.
- Any recordable in-house event.
- Receipt of articles or reports, such as publications and trade magazines, having potential applicability to departmental activities.

In some cases, it may be useful to provide a written or verbal summary of the identified lessons learned to your organization's Lessons Learned Coordinator prior to preparing the lessons learned document. This step is useful to ensure that the experience qualifies as a lessons learned. To assist with the process of identifying lessons learned, the following questions may be helpful:

- What was the event?
- What was the action(s) taken to stabilize the event?
- What was the approximate cost to correct the concern?
- Was this the proper action(s)?
- Was this action the final corrective action(s) or should other action(s) have been taken?
- Is the event applicable to the Area, Department, Division, Site or other DOE organization?
- Was the event safety, regulatory, design, programmatic, documentation, or other related?
- If the event was safety-related, did it involve an employee, the environment, or equipment?
- If the event was regulatory-related, did it concern RCRA or CERCLA?
- Did the event result in a cost, schedule, or technical impact?

## **Determining What is Not a Lessons Learned**

The decision to communicate an experience as a lessons learned should be based on whether or not the information has importance to others. Sometimes this importance is obvious, such as information that can reduce costs or risks. At other times, it may be difficult to determine the value to others. It is always important to keep in mind that over-reporting leads to an overburdened lessons learned system that contains information that may not be meaningful. However, under reporting leads to the loss of valuable information.

Although it is generally better to over-report than to under-report, there are several categories of information that should never become lessons learned. These categories include: information that is common knowledge (already known by the general population); information tied to experiences that are extremely low risk; and information tied to one-time experiences (process, operations, etc. that will never be repeated). For further discussion regarding what is not a lesson learned, see the Air Force Lessons Learned Validator's Guide in Volume II, Appendix V. Although DOE criteria will likely differ from Air Force criteria, the discussion may be useful in developing guidelines for your site or facility.

## **Preparing a Lessons Learned Document**

DOE organizations may use the template included in the Lessons Learned Technical Standard as the basis for preparing lessons learned documents or may develop their own template for internal use. However, all documents that are disseminated DOE-wide through the Lessons Learned Information Services must be in the template format provided in the DOE Technical Standard. This requirement is to ensure that all lessons learned shared complex-wide are consistent, easy to access, and understood by all DOE organizations. The DOE-wide lessons learned template requires the following information:

- Title
- Identifier
- Date
- Originator
- Contact
- Name of Authorized Derivative Classifier
- Name of Reviewing Official
- Priority Descriptor
- Functional Category(s)
- Keyword(s)

- References
- Lessons Learned Statement
- Discussion of Activities
- Analysis
- Recommended Actions

These elements are defined in the Lessons Learned Technical Standard. The summary statement and discussion of events should include any information that may assist others in avoiding a similar experience (if negative) or repeating the experience (if positive).

Multiple functional categories may be assigned to each lesson learned. An effort should be made to identify all of the applicable categories in order to assist others with accessing the lesson learned through functional category searches (See Volume II, Appendix VI for a list of functional categories). A list of relevant key words associated with the lesson should also be included in the document to assist others with accessing the lesson through key word searches. Preparation of a lessons learned document may include the following actions:

***Originator***

- Prepare a draft lessons learned document using the DOE-wide lessons learned template or your organization's format.
- Ensure that the draft contains no classified information and contains only appropriate use of vendor names. See "Security Issues and Use of Vendor Names" (provided below).
- Route the lesson learned to your Site Lessons Learned Coordinator or Point of Contact for review, priority classification, review by Authorized Derivative Classifier and/or Reviewing Official, and assignment of unique identification number.

## Security Issues And Use Of Vendor Names

### *Security Issues*

Ensure that lessons learned documents contain no classified information. If there is a question as to whether the draft contains classified information, THEN

- a. Consult an Authorized Derivative Classifier (ADC).
- b. Ensure that classified information is removed from all draft documents.

### *Guidelines for Using a Manufacturer's Name in the Lessons Learned System*

To avoid the possible appearance of slander of goods or commercial disparagement, care must be taken when information about manufactured goods, services or products is distributed on the lessons learned services. The following guidelines are intended to advise lessons learned originators, coordinators, and validators about the appropriate use of a manufacturer's name on the system.

Certain situations may warrant inclusion of a manufacturer's name. For example, when:

1. Worker safety and health could be affected;
2. A potential for property damage exists;
3. There is a demonstrated need to track the failure rate or trending of problems associated with a particular type of goods or products; or
4. The manufacturer's name is essential for utilizing the actual lesson learned.

When it has been determined that a manufacturer's name should be referenced or included in a lesson learned, the following guidelines should be followed:

1. State facts only. Do not include opinions.
2. Draw no conclusions from the facts.
3. Describe the circumstances of the failure or shortcoming of the goods, services, or products.
4. Discuss the extent or the problem.
5. Notify the manufacturer or vendor and explain the problem. If the manufacturer undertakes corrective action (such as issuing replacement parts), include a statement of that fact in the Recommended Actions/Resolutions section of the template. Also, notify the appropriate department personnel about the problem, i.e., quality assurance, procurement or safety and health personnel. If appropriate, include a contact's name and telephone number.
6. Document discussion with manufacturer.

### ***Organization Line Manager***

- Review the draft lesson learned and send it to the appropriate SME to validate the technical accuracy of the document, assist with keyword or functional category designations, confirm priority descriptor, and confirm applicability to other organizations.
- Send the validated document to the organization's director/manager for approval and release.
- Distribute the lesson learned internally to the appropriate organizations within your site or facility. Distribution methods should be determined by your organization and may include electronic mail, bulletin boards, or other options.
- If the lesson is applicable DOE-wide, format the document in conformance with the DOE lessons learned template, ensure that a unique identification number is included in the document, and place on the DOE Lessons Learned Information Service and, if appropriate, the DOE Lessons Learned List Server.

Each Operations Office should develop a numbering scheme for their lessons learned that are placed on the DOE Lessons Learned Information Service. The numbering scheme should be consistent with the description of the Lessons Learned Identifier provided in the Lessons Learned Technical Standard. This description is as follows: "a unique identification number to assist in referencing a lesson learned including calendar year, operations office identifier, organization of field/area office/contractor identifier, and a sequential number (e.g., 1995-CH-BNL-0019; 1995-ID-LITCO-0118)." Although there is no requirement for numbering internal lessons learned, it is recommended that a numbering system be developed to assist with storing and accessing lessons learned.

### **Helpful Tips for Writing a Lesson**

- Be concise and brief in the description of the lesson and recommendations.
- Include examples which indicate scope of applicability.
- Spell out acronyms.
- Include contact person for follow-up information.
- Obtain classification review prior to entry on any computer system.

## Reviewing and Validating a Lessons Learned Document

### *Subject Matter Experts*

- For lessons learned requiring validation, the SME should complete an evaluation. To ensure timely evaluation, an evaluation priority should be attached to each lesson learned sent to the SME. For example, lessons may be designated as either urgent (to be completed within 10 working days) or routine (to be completed within 30 working days). A transmittal memo accompanying the lesson should identify the priority and the date by which the evaluation is to be completed.
- The SME should determine the applicability and significance of the potential lessons learned by evaluating the adequacy of current procedures, design practices, status of regulatory compliance, etc. This evaluation process can be aided by establishing classifications, or designators, for the SMEs to use when evaluating potential lessons learned. One method is to classify potential lessons learned as Not-Applicable, Applicable- No Action Required, or Applicable-Action Required. Definitions and recommended actions for these classifications are:
  - **Not-Applicable:** This response may be used for a potential lesson learned that does not meet the site-specific lessons learned program criteria. Examples include employee concerns or complaints.
  - **Applicable-No Action Required:** This response may be used for a lesson learned that meets the site-specific lessons learned program criteria but does not require any change in site activities or programs. This determination may be due to the fact that current procedures, training, etc., already address the lesson learned being submitted. Examples may include identifying good work practices, having a lesson learned identified more than once, or a change in site practices due to an audit finding.
  - **Applicable-Action Required:** This response may be used for a lesson learned that meets the site-specific lessons learned program criteria and requires a change in site activities or programs. The SME should provide recommendations for possible corrective actions to assist in effective implementation of the lesson learned. Examples could include improved methods to sample ground water or new methods to perform preventative maintenance to reduce labor costs.

Regardless of the classification and action method(s) used by the site lessons learned program, consideration should be given to keeping the originator of the potential lessons learned informed of the final decision concerning his/her submittal. An effective site-specific lessons learned program is dependent upon use by site personnel and should be an ongoing process throughout the life of the site, or project. To meet this goal, the site-specific lessons learned program should include a

method to inform the person who submitted the lesson learned of the final outcome so as to encourage site personnel to continue to use the lessons learned process.

***Lessons Learned Coordinator***

- Once complete, the lessons learned evaluation should be returned to the Lessons Learned Coordinator. The Lessons Learned Coordinator should review the recommended corrective actions and forward to the Facility Manager. The Lessons Learned Coordinator may send the lesson learned to SMEs in several different functional areas for evaluation. For example, a lesson learned may be sent to a maintenance trainer, a maintenance engineer and a maintenance procedure writer to develop the most efficient and effective course of action.

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## Section 3.2

### Disseminating Lessons Learned

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Lessons learned can be disseminated through electronic or non-electronic means. Both of these options can be used to disseminate lessons learned locally (e.g. across a particular site), DOE-wide, nationally (including external organizations and the public), or internationally. Dissemination decisions should weigh issues such as existing dissemination requirements, security concerns, scope of applicability, and timeliness. These issues affect the type of dissemination that is appropriate. For DOE-wide dissemination, the DOE Lessons Learned Program provides several electronic options. These options, as well as non-electronic options, are discussed below. (The "DOE Lessons Learned Program" is the combined network of site DOE lessons learned programs. The DOE Lessons Learned Program provides communication linkages across site-specific programs through methods discussed below.)

#### Electronic Dissemination

The DOE Lessons Learned Information Services (DOELLIS) will utilize Internet to make information developed at local levels available to other sites across the DOE complex. Internet is a collection of networks and routing devices that provide global connectivity between educational, governmental, and commercial organizations for the purpose of information exchange. Access to Internet will provide DOE sites with access to local lessons learned information as well as to a wide range of information from users across the world. While Internet will provide a vehicle for transferring and accessing lessons learned information across DOE, the process will be facilitated through the use of information services established at DOE. Specifically, access to DOE lessons learned information will be provided through DOE's Office of Environment, Safety and Health Technical Information Services (TIS).

TIS is a collection of services rather than a traditional information system. TIS provides seamless applications that span multiple information sources and are presented to the user through a graphical user interface. The graphical user interface provides a common format for the TIS services. This means that many of the skills required to use a single application can be applied to operation of all applications. The user can, therefore, focus on the information rather than learning about multiple systems. In addition, all of the applications are able to exchange information (e.g., if a user needs to view or analyze data found in a database, the data can be copied into an analysis tool). In addition, TIS employs open systems architecture. The term "open system" means that the existing system can be adapted and can evolve as needs and technologies change without losing existing information. Key benefits of the open system include:

- Transparent access of data among different hardware systems;

- Interoperability of applications and systems;
- Independence from a particular hardware and software environment;
- Flexibility to change and expand;
- Capability to integrate data and systems from different sources;
- Greater leverage with systems and application suppliers gained by the clear articulation of system requirements; and
- Access independent of physical geography.

The TIS definition of open systems applies more to the protocol than it does to the platform. These open system protocols are used to develop a system of independent processes that will appear to the end user as a unified whole. As long as the user conforms to the TIS communications protocols, the user may choose any hardware platform, graphical user interface, or specific application. This means that TIS will interface equally well on an IBM PC, Macintosh, UNIX workstation, or other computing platform. Similarly, users may access TIS services, such as electronic mail, through their choice of application (e.g., Eudora, cc:mail or another mail viewing program).

### ***Protocol Requirements for Accessing DOE Lessons Learned Information Services***

The basic services that will be used to exchange lessons learned information are described below, along with the protocols that will be used to implement each service. "Protocol" refers to the formal description of message formats and the rules that two or more computers must follow to exchange those messages.

### ***Bulletin Board Services (Gopher Services)***

[Reference: RFC1436 The Internet Gopher protocol (a distributed search and retrieval protocol)] The term "Gopher" refers to a user application that is used for browsing the Internet. Gopher facilitates the search and retrieval process. The bulletin board services allow users to electronically access current information such as conference dates, publications, and information bulletins that are posted by other users. Users can review, print, or retrieve information that is posted on a bulletin board. TIS bulletin board services/Gopher provide access to multiple bulletin boards, including the DOE lessons learned bulletin board (to be established).

A lessons learned bulletin board will be established to allow users to post and access lessons learned information. In addition, the TIS bulletin board service will allow users to access worldwide information including safety-related information provided by universities and research centers. Bulletin board information can include formatted documents as well as graphics and audio files.

Sites can place information on the Gopher servers in American Standard Code for Information Interchange (ASCII) format to allow the information to be searched and easily cut and pasted into locally prepared documents for dissemination within sites/facilities/areas. In addition, formatted documents may be placed on the servers to allow users to duplicate the formatted documents using their local word processing applications.

### ***Electronic Mail Services***

(Simple Mail Transport Protocol and Post Office Protocol) The TIS mail services allow users to send and receive messages electronically from individuals or groups at DOE, DOE contractors, and others worldwide. Users can read, print, reply, forward, and store messages. Documents or pictures can also be attached to electronic mail messages. Electronic mail is sent and received across Local Area Networks and Wide Area Networks, including Internet. In order for electronic mail to be sent and received between sites, it will be important for all Lessons Learned Coordinators to establish an electronic mail address with a gateway to the Internet.

### ***News Groups***

(Network News Transport Protocol) News groups will be used to exchange ideas, views, and generally provide a forum for ongoing, on-line discussions. Discussions in news group forums take place via electronic mail messages that are sent to a news group address. The news groups provide a means for collecting messages about single topics into common areas. News groups continually evolve yet maintain information from past discussions. The news groups will provide a repository for informal lessons learned information, a means of holding informal discussions across DOE, and a "corporate memory" to assist individuals who are newly involved with the lessons learned process. Participation in the news groups will foster sharing of ideas and development and implementation of lessons learned at individual facilities/sites/areas.

### ***List Service***

(Simple Mail Transport Protocol) The list service provides a vehicle for sending messages to established lists of recipients. The list service is generally used to facilitate rapid transfer of urgent or important messages to key individuals. For lessons learned, the list service will be used to communicate urgent messages to the Lessons Learned Coordinators and other key individuals. When a message is posted to the list service, an automatic forwarding of the message to those individuals will occur. More information regarding the DOE Lessons Learned List Service is provided in "Answers to Frequently Asked Questions About the DOE Lessons Learned List Service" (See Volume II, Appendix XIII).

### ***World Wide Web Services***

The World Wide Web (WWW) is a protocol to access information. WWW viewers gather Internet resources from all over the world into a series of menu pages or screens that

appear on the user's computer. Hypermedia is the foundation of the WWW. Media refers to the type of data that users find on the Internet (audio, file, graphic, text, or movie). Hypermedia is a new way of connecting this media together in a non-linear fashion. For example, if a document mentions the space shuttle taking off, the user can choose to see a picture of the shuttle taking off, move into a history of the shuttle program, and then move back to the original document. Mosaic, a WWW viewer, is an Internet browsing tool that provides greater functionality than Gopher. At present, WWW services are being implemented at many DOE facilities and at DOE Headquarters. However, WWW is not yet fully available through TIS. Therefore, the exchange of DOE lessons learned will initially focus on use of the Gopher services. Use of WWW services will be explored in the near future (FY96).

### ***System Requirements for Accessing DOE Lessons Learned Information Service***

The preferred (and suggested) method for obtaining access to the DOELLIS is through the use of client software in a Graphical User Interface (GUI) platform such as Windows, Macintosh, or UNIX X-Windows. Software is available for each of these platforms that provides a consistent user interface.

#### ***IBM PC Compatible***

System requirements for IBM/IBM compatible computers include MS DOS 3.1 or higher, Windows 3.1 or higher, 5 MB disk space, 4 MB RAM (8 MB recommended), 80386 or higher CPU, high speed modem (9600 minimum, 14.4 recommended) or network adapter card, Windows Sockets 1.1 API for Windows compliant client software.

#### ***Macintosh***

System requirements for Macintosh computers include system 6 operating system or higher, 5 MB disk space, 4 MB RAM (8 MB recommended), high speed modem (9600 minimum, 14.4 recommended) or network adapter card, TCP/IP Connection for Macintosh.

### **Non-Electronic Dissemination Methods**

There are many options available for sharing lessons learned across the DOE complex. Electronic methods of dissemination (i.e., information storage and retrieval systems, electronic mail, and lessons learned bulletin boards) are envisioned as one means by which lessons learned information will be shared across the DOE complex. Because electronic dissemination has limitations and may not fully serve all necessary staff (e.g., field workers that do not have immediate access to computers), additional non-electronic options are provided below. Many of these options have already been implemented by organizations across DOE.

#### ***Interpersonal Information Exchange***

Many workshops, meetings, seminars, conferences, and other types of interpersonal communication and information exchange take place across DOE. Exchanges are both

formal (planned events) and informal (casual discussions). These exchanges can all be viewed as potential vehicles for transfer of lessons learned. Suggested options for increasing interpersonal information exchange focused on lessons learned are listed below:

- Use on-site "tool-box" meetings to provide field employees with a direct and timely transfer of applicable lessons learned information.
- Use monthly safety meetings to communicate applicable lessons learned that have been placed on the system in the past 30 days.
- Use teleconferencing for cross-complex sharing between employees working on similar projects.
- Use video conferencing to communicate information that requires visual interaction (e.g., application of a new technology).
- Create organizational or functional groupings of jobs with related knowledge, skills, and performance requirements. Conduct lessons learned workshops, meetings and briefings focused on these specific areas.
- Use annual Occurrence Reporting Workshop to emphasize exchange of lessons learned.
- Use Quality Improvement Groups to identify applicable Good Work Practices from across the complex and include them in Quality Improvement Plans.
- Organize periodic "brown bag" lunches that include discussions and presentations on lessons learned.
- Use staff meetings to share lessons learned.
- Use departmental "all-hands" meetings to discuss lessons learned from activities both inside and outside of DOE.
- Use working groups to exchange lessons learned (e.g., Root-Cause Analysis groups, Management Safety Steering Groups, Training Councils, Self-Assessment Working Groups, Operations Security Working Groups).
- Encourage employee participation in conferences. Require attendees to share what they learned through presentations.
- Establish a working group that includes all Lessons Learned Coordinators and focuses on overall improvements to the DOE Lessons Learned Program.

### ***Publications***

There are many site-specific publications that include lessons learned information (e.g., quarterly lessons learned bulletins, health and safety summaries, weekly newsletters, and operating experience weekly summaries). Publications can be distributed in hard copy or made available through electronic means. Potential options for sharing lessons learned through publications are provided below:

- Use Internet to access publications from across the complex.
- Develop the capability to access publications through phone and fax machines. For example, Sandia National Laboratory recently established a means of sharing and accessing documents utilizing phone and fax lines, referred to as the "Sandia Line." It can be accessed by calling the central Sandia Line number (505) 845-6789 and following prompts to identify general topic areas and obtain specific documents. Documents are placed on the system by faxing them to the Sandia Line computer. An index of all available documents can be obtained by calling the system. Requested documents are sent directly from the Sandia Line system to the user's fax machine with minimal delay. The Sandia Line is accessible across the DOE complex and, although it currently contains only documents placed on the system at Sandia, the service can be expanded to accommodate documents from other sites. For example, lessons learned that are placed on a Wide Area Network for DOE-wide computer-based access could also be faxed to the Sandia Line for telephone/fax access. In addition, site-specific publications that document lessons learned could be placed on the system to facilitate dissemination.

See Volume II, Appendix VIII for examples of site-specific documents used to transmit lessons learned.

### ***Reviews and Evaluations***

Numerous types of reviews are conducted across DOE (e.g., operational readiness reviews, readiness assessments, program reviews, post-project reviews, audits, appraisals, and self-assessments). Each review generally results in a series of review findings that are documented in a final report. Formal responses are often prepared to address the findings. The reviews provide an important source of feedback about projects and operations and a valuable vehicle for transfer of lessons learned. Several potential options for sharing lessons learned through review processes are listed below:

- Discuss lessons learned in review meetings and close-out sessions.
- Require that a description of lessons learned be included in review reports.
- Document and track actions that are taken to address review and audit findings. Note successful actions and, when appropriate, communicate as Good Work Practices.

### ***Visual Dissemination***

For employees that share office space, cafeterias, meeting rooms or other areas, lessons learned bulletin boards can be an effective way of sharing information or emphasizing a learning theme. Potential options include:

- Poster campaigns focused on a key message, slogan, or theme.
- Designated areas for posting Red Alerts.
- "Good Work Practices" bulletin board with a lesson learned that changes weekly.
- Posting of lessons learned in rest rooms and other public areas (often referred to as the "porcelain press").

***Additional Options***

- Use Voice Mail to communicate important messages.
- Use "log-on" messages to display important messages as soon as employees log-on to their computers.
- Establish a broadcasting newsline in areas where employees take breaks. Continuously broadcast videos or news briefs that communicate lessons learned information.
- Benchmark specific processes or operations against similar processes or operations in other organizations internal or external to DOE. Identify the "best in class," compare performance, and extract applicable lessons learned. Disseminate through presentations or benchmarking reports.

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## Section 3.3

### Utilizing and Incorporating Lessons Learned

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Utilizing and incorporating lessons learned is commonly referred to as "closing the learning loop." There is no reason to document lessons learned and make this information available to others if it is not going to be used (i.e., fed back into processes and activities). This element of the lessons learned process is critical yet frequently does not receive adequate attention. In order to benefit from information that is made available, it is important to assess its applicability, disseminate it to personnel, and make sure that appropriate actions are identified and carried out. Efforts to identify relevant lessons learned should be made on a continuous basis.

#### **Identifying Applicable Lessons Learned**

When planning new activities, the DOE LLIS should be reviewed to determine whether lessons learned are available that can improve planning decisions. Relevant lessons should be incorporated into the instructions (work plan, work packages, engineering work instruction, etc.) for that activity. In the life of every project there are many decision points that provide opportunities for incorporating the experience of others. It is useful to identify these decision points and include lessons learned searches in schedules of planned management activities. It is also worthwhile to ensure that there are staff designated to periodically scan site-specific and DOE-wide lessons learned information systems and other lessons learned sources (See Volume II, Appendix XI for an index of professional and industry information sources). The DOE LLIS provides several options: key word searches and functional category searches of the DOE-wide server, bulletin boards, electronic mail, and newsgroups (See "Dissemination of Lessons Learned" section of this Handbook).

- Functional category searches provide the capability to locate lessons from predefined categories (See DOE Lessons Learned Technical Standard, Appendix D).
- Lessons Learned Bulletin Boards (Gopher) allows the user to access and retrieve information posted by other sites.
- Electronic Mail provides an electronic means for users to send and receive messages and documents.
- Newsgroups provide users with the ability to exchange information, ideas, and views in a forum environment without being in the same location.
- List Servers can be used to communicate urgent messages to Lessons Learned Coordinators and other key individuals.

## Review Lessons Learned Documents for Applicability

It is suggested that DOE organizations establish a process for determining the applicability of each lesson learned and for determining what actions will be taken as a result of the information. It is useful to establish specific steps so that there is no confusion about the expected procedure. For example:

IF the lesson learned applies to your organization and is significant enough to warrant corrective actions,

THEN determine the appropriate action(s) to respond (formal or informal) and obtain proper approval authority.

IF formal action is appropriate,

THEN enter the condition into the site corrective action tracking system.

IF informal action is appropriate,

THEN distribute the lesson learned in the most effective way appropriate for your situation. This may include:

- Entering the lesson learned into required reading.
- Discussing the lesson learned at a safety meeting.
- Forwarding the lesson learned to the appropriate persons electronically.
- Posting a hard copy of the lesson learned document on a bulletin board.

In addition, the following steps should be taken:

- Enter requests for facility modifications into the appropriate system or contact the appropriate management representative.
- Route any lessons that affect training materials to your organization's training department for action.
- Disseminate the lesson learned to all employees that may benefit from it.

Remember that corrective actions such as required reading and training rely mainly on human memory. Without frequent use or review, memory may fade. These methods should be combined with other options or used when the problem is temporary.

## Distributing to Appropriate Staff

Distribution of the lesson learned should be determined by its nature, urgency, and desired audience. For each lesson learned, identify the recipients, how quickly it should be distributed, and when any required reading is due. Timeliness is an important element of distribution. In general, any lesson learned that is urgent (color-coded red for DOE-wide distribution) should be distributed immediately. Specific instructions should be developed for dissemination of urgent lessons learned. The DOE Lessons Learned List Server should be included as a vehicle for immediate dissemination.

## **Incorporating Lessons Learned into Ongoing Training**

Lessons learned that are applicable DOE-wide should be incorporated, as appropriate, into Department-wide training programs. Incorporation of lessons learned into facility or site-specific training is also important. Action plans that are developed to address specific lessons learned should include identification of affected training programs. Lessons Learned Coordinators should ensure that the groups responsible for developing and implementing training programs are notified when applicable information is identified through lessons learned.

## **Implementing Corrective Actions**

Implementation of corrective actions will vary according to the lesson learned (some lessons learned will not require corrective actions). Important elements of corrective action implementation include:

- Timeliness (ensure that a reasonable target date is set that is consistent with the urgency of the lesson learned).
- Assignment of a responsible party (Facility Manager, or designee, should be responsible for ensuring that corrective actions are implemented).

Appropriate actions (the actions chosen for implementation) should be based on a careful evaluation of the experience. Examples of corrective actions include:

- Required reading
- Procedure revision
- Special training
- Immediate physical action (e.g., change the facility, component, structure, or system)

When appropriate, the Lessons Learned Coordinator should track corrective actions to ensure timely completion and provide monthly status reports to the Facility Manager. Once the corrective action is completed, the Lessons Learned Coordinator should update the lessons learned tracking system indicating completed corrective action(s). (See Volume II, Appendix IX for examples of a corrective actions tracking tables and other related material.) The Lessons Learned Coordinator should also review the completed corrective actions to ensure that they adequately address the original concern.

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## **Phase IV**

# **Performance Measurement and Continuous Improvement**

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## Section 4.1

### Performance Measurement

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Performance measurement describes what has been accomplished and how well it was done. Through the use of either "top down" or "bottoms up" methods, performance measurement criteria provide standards against which project progress can be evaluated. Top down performance measurement is tied to program mission, goals, and objectives, and focuses on outcomes and outputs. Bottom up performance measurement is generally tied to the cost, schedule, and technical baselines of specific projects, and focuses on calculations of earned value for costs, critical path assessment for schedules, and technical performance indicators for technical scope. Performance measures for lessons learned programs are based on the top down method and are developed based on specific performance goals or standards. In addition, they are developed with input from as many cognizant employees as possible and are customized to address the needs of specific levels of management and units of analysis (i.e., projects, programs, processes or operations).

There are many guidance documents available to assist the development of performance measures. Many Operations Offices and Management and Operating Contractors have performance measurement guidance available that describes the purpose and general characteristics of effective performance measures. A good source of guidance was developed by a work group commissioned by the Department of Energy Nevada Operations Office (DOE/NV) Quality Forum. The guidance document, the DOE/NV Quality Forum, Performance Measurement Process Guidance Document, provides a comprehensive, step-by-step explanation of how to develop performance measurements at any level within an organization and how to evaluate their effectiveness. The work group also developed a case study that provides a practical example of how to put the concepts of the guidance document to use. Much of the material provided in this section is summary information taken directly from the DOE/NV *Performance Measurement Guidance Document*. For additional details on the specific steps of developing performance measures, obtain a copy of the *Performance Measurement Guidance Document* by contacting Raytheon Services Nevada, (702) 794-5415.

#### What are Performance Measures?

Performance measures quantitatively tell us something important about our products, services, and the processes that produce them. They are a tool to help us understand, manage, and improve what organizations do. Performance measures let us know:

- How well we are doing
- If we are meeting our goals

- If our customers are satisfied
- If our processes are in control
- If and where improvements are necessary

A performance measure is composed of a number and a unit of measure. The number gives us a magnitude (how much) and the unit gives the number a meaning (what). Performance measures are always tied to a goal or an objective (the target). Performance measures can be represented by single dimensional units like hours, meters, dollars, number of reports, or number of errors. They can show the variation in a process or deviation from design specifications. Single dimensional units of measure usually represent very basic and fundamental measures of a process or product.

More often, multi-dimensional units of measure are used. These are performance measures expressed as ratios of two or more fundamental units. These are units like miles per gallon, number of accidents per million hours worked, or number of on-time vendor deliveries per total number of vendor deliveries. Performance measures expressed this way almost always convey more information than the single dimensional or single unit performance measures. Essentially, performance measures should be expressed in units of measure that are the most meaningful to those who must use or make decisions based on those measures.

Most performance measures can be grouped into one of the following six general categories. However, certain organizations may develop their own categories as appropriate depending on the organization's mission:

1. **Effectiveness:** A process characteristic indicating the degree to which the process output (work product) conforms to requirements. (Are we doing the right things?)
2. **Efficiency:** A process characteristic indicating the degree to which the process produces the required output at minimum resource cost. (Are we doing things right?)
3. **Quality:** The degree to which a product or service meets customer requirements and expectations.
4. **Timeliness:** Measures whether a unit of work was done on time. Criteria must be established to define what constitutes timeliness for a given unit of work. The criterion is usually based on customer requirements.
5. **Productivity:** The value added by the process divided by the value of the labor and capital consumed.

6. **Safety:** Measures the overall health of the organization and the working environment of its employees.

The attributes of a good unit of measure include:

- Reflects the customer's needs as well as our own.
- Provides an agreed basis for decision-making.
- Is understandable.
- May be interpreted uniformly.
- Is compatible with existing sensors (a way to measure that it exists).
- Is precise in interpreting the results.
- Is economic to apply.
- Can be obtained from existing data collection or accounting systems.

In addition, effective performance measures:

- Can be measured.
- Support the project's/program's strategic goals, objectives and priorities.
- Measure both good and bad outcomes/outputs.
- State the end results that are expected.
- Include a completion date or timeframe.
- Are developed with an assessment/recognition of the costs required to achieve them.
- Are challenging (motivate effective/efficient performance).
- Are achievable.
- Are mutually agreed to and understood by all affected parties.
- Are established with full participation of all parties responsible for achieving them.

### **What are the Benefits of Measurements?**

Listed below are seven important benefits of measurement:

1. To identify whether we are meeting customer requirements. How do we know that we are providing the services/products that our customers require?

2. To help us understand our processes. To confirm what we know or reveal what we don't know. Do we know where the problems are?
3. To ensure decisions are based on fact, not on emotion. Are our decisions based upon well-documented facts and figures or on intuition and gut feelings?
4. To show where improvements need to be made. Where can we do better? How can we improve?
5. To show if improvements actually happened. Do we have a clear picture?
6. To reveal problems that bias, emotion, and longevity cover up. (If we have been doing our job for a long time without measurement, we might assume incorrectly that things are going well.)
7. To identify whether suppliers are meeting our requirements. Do our suppliers know if our requirements are being met?

In addition, methods to measure and demonstrate progress provide significant benefits to any program. These benefits include:

- Defining project or activity objectives.
- Increasing managerial and financial control.
- Identifying problems during the project or activity, not afterward.
- Identifying when and where action is needed.
- Making accomplishments visible.
- Improving reporting of progress and results.
- Expanding communication links.

### Why Do We Need to Measure?

Measurement improves management. Without dependable measurements, intelligent decisions can be difficult to make. Measurement can be used for:

1. **Control:** Measurement helps to reduce variation.
2. **Self-Assessment:** Measurements can be used to assess how well a process is doing, including improvements that have been made.
3. **Continuous Improvement:** Measurements can be used to identify defect sources, process trends, defect prevention, and to determine process efficiency and effectiveness, and opportunities for improvement.

4. **Management Assessment:** Without measurements there is no way to be certain we are meeting value-added objectives or that we are being effective and efficient. The basic concept of performance measurement involves (1) planning and meeting established operating goals/standards; (2) detecting departures from planned levels of performance; and (3) restoring performance to the planned levels or achieving new levels of performance.

## What is the Foundation for a Performance Measurement System?

Successful performance measurement systems adhere to the following principles:

1. Not measuring too much. Measuring only what is important: things that impact customer satisfaction.
2. Focusing on customer needs: We should ask our customers if they think this is what we should be measuring.
3. Involving employees (workers) in design and implementation of the measurement system: Gives them a sense of ownership and improves quality of the measurement system.

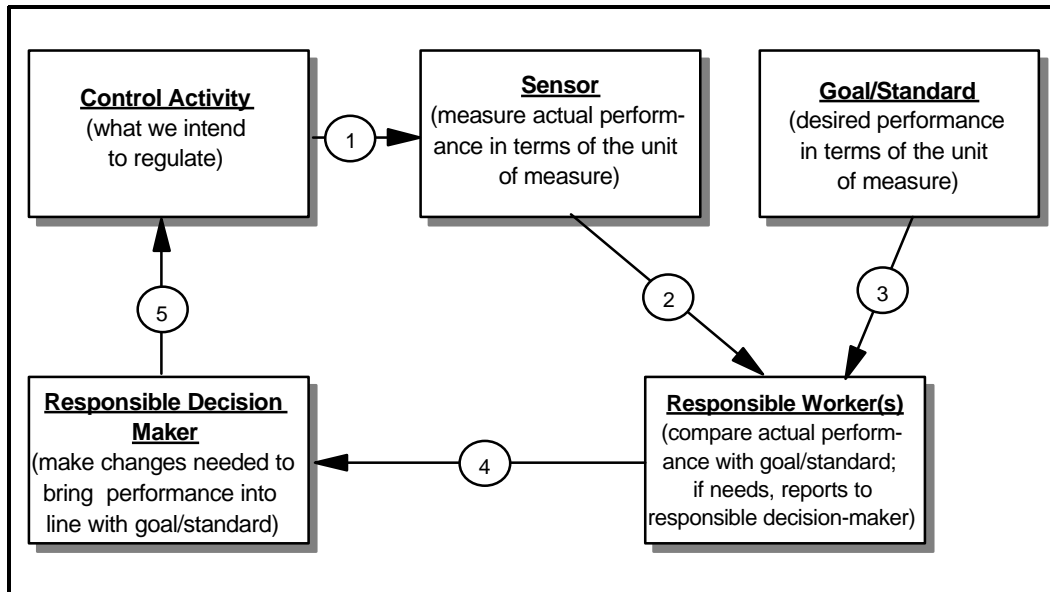
The basic feedback loop shown in Figure 4 presents a systematic series of steps for maintaining conformance to goals/standards by communicating performance data back to the responsible worker and/or decision maker to take appropriate action(s).

The message of the feedback loop is that to achieve the goal or standard, those responsible for managing the critical activity(s) must always be in a position to know (a) what is to be done; (b) what is being done; (c) when to take corrective action; and (d) when to change the goal or standard.

The basic elements of the feedback loop and their interrelationships are:

1. The **Sensor** evaluates actual performance.
2. The **Sensor** reports this performance to a Responsible Worker.
3. The **Responsible Worker** also receives information on the goal or standard.
4. The **Responsible Worker** compares actual performance to the goal. If the difference warrants action, the worker reports to a Responsible Decision Maker.
5. The **Responsible Decision Maker** verifies variance, determines if corrective action is necessary, and, when required, makes the changes needed to bring performance back into line with the goals.

**Figure 4**  
**Performance Measurement Feedback Loop**



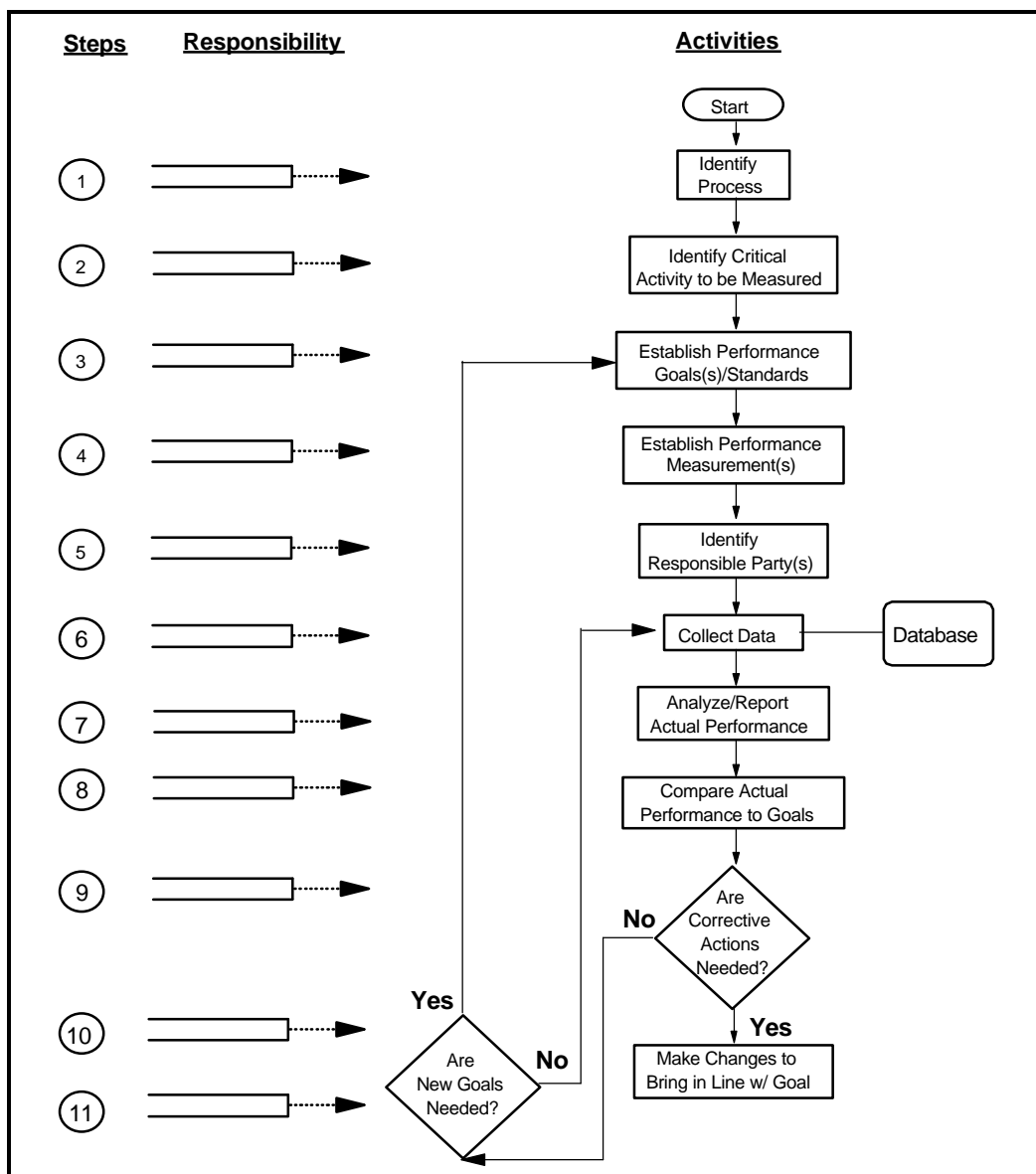
## Measuring Outputs vs. Outcomes

Performance goals generally relate to either "outputs" or "outcomes." For example, a calculation of the number of personnel that completed a training program would be an **output** measure. Increased effectiveness or productivity resulting from the training program would be an **outcome** measure. Outcome measures are considered to be the most important for policy purposes, but output measures are frequently considered a useful management tool. A common problem in program performance measurement is an over-reliance on output measures. Outcome measures are often difficult to develop because outcomes are difficult to measure. However, it is important that both outputs and outcomes be considered when developing performance measures for your lessons learned program.

## Process Overview

Figure 5 shows a high-level block diagram of the performance measurement process which is separated into eleven discrete steps. This diagram is intended to show the process generically. It is suggested that sites adapt the diagram, as necessary, to fit their own programs.

**Figure 5**  
**Performance Measurement Process**



A brief description of each of the process steps follows:

1. **Identify the process.** The first and perhaps most important step. Employees must first agree on the process(es) being measured before they can effectively develop measures or utilize the output of what they have measured.
2. **Identify critical activity to be measured.** The critical activity is the culminating activity within a process where it makes the most sense to locate a sensor and define an individual performance measure.
3. **Establish performance goal(s) or standards.** All performance measures should be tied to a pre-defined goal or standard, even if the goal is at first somewhat subjective. Goals and standards are necessary to meaningfully interpret the results of your measurements and gauge the success of your management systems.
4. **Establish performance measure(s).** In this step individual measures are identified.
5. **Identify responsible party(s).** A specific entity (a team or an individual) needs to be given responsibilities for each of the steps in the performance measurement process.
6. **Collect data.** Data collection includes more than just writing down numbers; It is suggested that data be pre-analyzed in a timely fashion to identify early trends and confirm the adequacy of the data collection system.
7. **Analyze/report actual performance.** In this step, raw data are formally converted into performance measures, displayed in an understandable form, and disseminated in a report or other written format.
8. **Compare actual performance to goal(s).** Compare your performance to your management's pre-determined goals or standards and determine the variance (if any).
9. **Are corrective actions needed?** Depending on the magnitude of the variance between measurements and goals, some form of corrective action may be required.
10. **Make changes to bring back in line with goal.** This step only occurs if corrective action is necessary. The actual determination of the corrective action is part of the quality improvement process, not the performance measurement process.

11. **Are new goals needed?** Even in successful systems, changes may be needed in identified goals, which should strive to challenge an organization's resources, but not overtax them.

### **Examples of Lessons Learned Performance Measures**

There are two kinds of performance measures that are relevant to lessons learned programs: those that measure how well the lessons learned program is operating and those that measure organizational progress/success achieved as a result of the lessons learned program.

#### ***Measures of Lessons Learned Program Performance***

Note: Some of these measures apply specifically to the success of the DOE-wide Lessons Learned Program (how well information is being generated/accessed across the complex). Others are more applicable to site-specific lessons learned programs.

- Number of new DOE users that access the system or contribute to the system per month. *Measures internal distribution/participant growth i.e., the success in expanding the reach of the lessons learned program across DOE*
- Number of lessons learned contributed from external sources (outside DOE) per month. *Measures external distribution/participant growth i.e., the success in expanding outside of DOE.*
- Number of times the system is accessed per month.
- Number of new lessons learned placed on the system per month.
- Number of inputting errors identified in the lessons learned system per month.
- Number of sites that claim the lessons learned program has made a positive difference in their operations. *Determined through annual survey.*
- Number of sites that claim that the benefits of maintaining a lessons learned program outweigh the costs. *Determined through annual survey.*
- Number of times per year that the lessons learned program is recognized by senior DOE officials or external organizations (e.g., GAO or Congress) for its positive impact on DOE.
- Number of different functional categories attached to lessons learned placed on the LLIS per year. *Measures the degree to which the lessons learned program is fully integrated across all organizational areas (beyond traditional ES&H).*
- Number of sites able to produce lessons learned trending reports per year. *Cannot be measured for at least a year after start of the lessons learned program being measured.*
- Number of staff at each site that are able to directly access lessons learned, either through electronic means or through hard copies of documents.

- Number (percent) of corrective action plans:
  - completed on time
  - delayed
  - cancelled
  - approved
  - modified
- Number of lessons learned backlogged (e.g., in need of reviewing, processing).
- Average man-hours to process average lesson learned.

### **Measures of Organizational Performance Impacted by the Lessons Learned Program**

- Dollars saved per fiscal year due to avoidance of negative events or implementation of good work practices. *Requires isolating the effects of information discovered through the lessons learned program.*
- Percentage of time lost to shut downs or work stoppages. *Must be able to show a change in the percentage of time lost, therefore must have a baseline measure in place from which to compare. Also, the changes must be directly connected to information received from lessons learned.*
- Number of specific actions taken per year as a result of lessons learned. These can be corrective actions or good work practices.
- Number of negative experiences that recur across the complex per year. *Must compare number over consecutive years to get performance measure.*
- Number of sites that mention lessons learned in their strategic plan and other high level planning documentation.
- Number of times per year that training programs are revised or updated to incorporate lessons learned.
- Number of personnel recognized for reporting to their supervisor events, conditions, or concerns that, due to lessons learned, they suspect may have health, safety, quality, security, operational, cost, or environmental implications.

### **Continuous Improvement**

#### ***Review and Self Assessment***

Annual or semi-annual reviews or assessments of lessons learned programs should be conducted to determine the status of the program, the benefits that have been gained by the program, and the problem areas. The complexity and depth of the review/assessment should match that of the lessons learned program being assessed. See Volume II, Appendix X for an example of a semi-annual review.

### ***Trending***

Trending can focus on use of the LLIS, implementation of good work practices, number of mistakes in a particular area or other elements that will provide useful information if tracked over time. Trending is frequently used to identify and analyze selected, similar events, including recurring equipment failures and generic underlying problems. Trend reports should be issued on a regular basis and should highlight issues of potential concern and the effects of steps taken to modify adverse trends.

For example, Virginia Power Company produces quarterly trend reports of their operating experiences based on deviations that are tracked in a computer database. Deviation reports are trended by overall program status, equipment/component/system related problems, personnel/procedure related problems, and by specific problem areas such as equipment, component, system, personnel, procedure, and common cause. Deviation reports are evaluated to identify adverse trends, patterns, or potential common failures and may result in a lessons learned action plan.

## **Developing Performance Measures for Lessons Learned Programs**

### **1. Develop Lessons Learned Objective(s) for the Organization**

- Base performance measures upon mission and vision statements.
- Identify PRODUCTS, CUSTOMERS, and PROCESSES.
- May include ratios such as productivity (outputs to inputs), differences such as profit (selling price minus input cost, or combination of several terms).
- State and define underlying "values" and quality factors.
  - Safety, rework, environmental soundness
- State optimal direction.
  - Maximize, minimize
- DO NOT list activities, processes, or numerical quotas.

2. Define performance measures for each lessons learned objective.
  - Each performance measure should reflect a process. Understanding the performance measure data and the underlying process is necessary in order to optimize the lessons learned objective.
  - Collect Performance Measurement Data:
    - a. If data to support the performance measures already exist:
      - Document source of data and define parameters for sorting.
      - Review the source of data and clean up anomalies.
      - Add new parameters to data collection if needed.
    - b. If data to support the performance measures does not exist:
      - Explicitly define data to be collected.
      - Create consistent and verifiable system to hold data.
      - Task person(s) to collect data.
3. Analyze the performance measures data for trends and significant changes.
  - a. Use Statistical Process Control (or other comparable methods) as the criteria to determine if trends and changes are occurring or if the data is stable.
    - If a significant change occurs, determine why. Assess costs of action vs. inaction, perform corrective action (if the performance measurement change was negative), perform reinforcing actions (if the change was positive), or take no action.
    - If the process is stable, determine if the performance is at an acceptable, stable value. Criteria to apply:
      - Continuous improvement
      - "Zero defects"
      - Risk vs. benefit analysis (Probability Risk Assessment)
      - Comparison against "benchmark" (other companies, INPO guidelines, etc.)
  - b. If a performance change is needed, the PROCESS must be changed.
    - Study the process and performance measure data.

- Using process improvement tools (e.g., root cause analyses, re-engineering) identify desired changes, and develop implementation plan.
  - Establish target(s) for benefits gained from the implementation plan.
  - Following implementation, assess the performance measure process change against targets.
4. Continuously re-evaluate the lessons learned objectives and related performance measures, as needed. The lessons learned objectives should be adjusted if customer needs change.



## CONCLUDING MATERIAL

### Review Activity:

<u>DOE</u>	<u>Field Offices</u>
DP	AL
EH	CH
EM	ID
NE	NV
NS	OR
RW	RL
ER	SF
AD	SR
FE	Fernald

### National Laboratories

BNL  
LLNL  
LANL  
PNL  
Sandia

### Area Offices

Amarillo Area Office  
Kirtland Area Office  
Princeton Area Office  
Rocky Flats Area Office

### Preparing Activity:

DOE Lessons Learned Process  
Improvement Team, Documentation  
Sub-team

### Project Number:

6910-0050